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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference F19007 GSK	**FOR FURTHER ACTION**	See Form PCT/IPEA/416
International application No. PCT/IB2005/051202	International filing date *(day/month/year)* 24.03.2005	Priority date *(day/month/year)* 24.03.2004
International Patent Classification (IPC) or national classification and IPC INV. A61L9/014 B01D53/84		
Applicant BBR BIOFILTRATION (PROPRIETARY) LIMITED et al.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 3 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☒ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

Date of submission of the demand 13.01.2006	Date of completion of this report 05.07.2006
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Nissen, V Telephone No. +49 89 2399-8619

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/IB2005/051202

Box No. I Basis of the report

1. With regard to the **language**, this report is based on

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of:

   - ☐ international search (under Rules 12.3(a) and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4(a))
   - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages	
1-12	as originally filed
Claims, Numbers	
1-14	filed with telefax on 13.01.2006
Drawings, Sheets	
1/2, 2/2	as originally filed

   ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☒ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☒ the claims, Nos. 15-17
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☒ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☒ the claims, Nos. 5
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/IB2005/051202

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-14
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-14
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-14
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item I.

1. The applicant has submitted new claims 1-14 to replace original claims 1-17. A sufficient basis is found for all amendments but one in the originally filed documents (Art. 34(2)(b) PCT):

1.1 In claim 5 the feature "controlling the humidity in the fluidized bed" has been introduced. Said feature allegedly finds basis on page 2, lines 13-19. However, in said passage only conditioning by moisturizing the bed is disclosed. "Controlling humidity" implies further means such as measuring and/or deliberately reducing the humidity. A basis for such broad interpretation is, however, not prima facie evident (Art. 34(2)(b) PCT).

1.2 For the purpose of the further examination of the present application it has been assumed that the applicant has intended to express the meaning as defined on page 2, lines 13-19.

Re Item VIII.

2. The subject matter of claim 5 is unclear (Art. 6 PCT) and possibly insufficiently supported (Art. 5 PCT) as it seems hardly possible to clean (normal) air under anaerobic conditions.

2.1 In respect of claim 6 it hardly seems possible to have a (real) fluidized bed which is not agitated through the mere air current (Art. 6 PCT).

Re Item V.

Reference is made to the following documents:

D1: SU-A1-1 287 923 (VNII BIOSINTEZA BELKOVYKH VESHCHESTV; FRUNZENSKIJ POLT INSTITUT) 7 February 1987 (1987-02-07)

D2: EP-A-0 147 721 (DECHEMA DEUTSCHE GESELLSCHAFT FUR CHEMISCHES APPARATEWESEN E.V) 10 July 1985 (1985-07-10)
D3: US-A-4 472 181 (HERRLANDER ET AL) 18 September 1984 (1984-09-18)
D4: DE 22 37 929 A1 (SCHUMACHER'SCHE FABRIK, 7120 BIETIGHEIM; SCHUMACHER'SCHE FABRIK GMBH &) 14 February 1974 (1974-02-14)
D5: US-B1-6 403 366 (KIM BYUNG JOON) 11 June 2002 (2002-06-11)

3. It is abundantly known to use micro-organisms to clean polluted air [vide D1-D5]. It is even known that a fluidised bed may increase efficiency of the process [vide D1, Derwent WPI abstract].

3.1 D1, which could be considered as representing the closest prior art, suggests that air, N_2 or other gasses can be cleaned by passing them through a sorbent layer of e.g. active carbon or expanded polymer granules comprising micro-organisms.

3.2 However, D1 does not disclose an actively stirred fluidised bed. Accordingly The subject-matter of claim 1 is novel.

3.3 Although generic vessels containing micro-organism-containing particulate and a mixing means would seem prima facie known, none of the cited documents disclose such apparatus which is also suitable for acting as a fluid bed in an air purification device. Accordingly also the subject-matter of claim 9 has been accepted as novel.

4. The applicant has argued that stirring the fluidised bed provides for various advantages such as ensuring more effective contact between the air and the particles [page 8, lines 22-25], thus higher transfer rates can be obtained [page 11, lines 19-23], a better exploitation of the space available to the bed [page 11, lines 25-32], better maintenance of optimum humidity [page 11, 32-34] and avoidance of problems with compaction, channelling in the bed [page 12, lines 1-2].

4.1 Although it ex post facto would seem obvious to address any issues of the above kind using agitation, there is no explicit teaching or hint in the cited prior art to that end.

4.2 Furthermore, it could be argued that a person skilled in the art would assume that a fluidised bed as such would be sufficiently agitated and should not be affected by any such issues and thus the applicant is the first to have realised the problems and the need for a solution.

4.3 Accordingly the applicant has been given the benefit of doubt, and the subject-matter of the independent claims 1 and 9 has been accepted as involving an inventive step (Art. 33(3) PCT). It follows that the dependent claims also involves an inventive step.

5. Industrial applicability is self-evident (Art. 33(4) PCT).

CLAIMS

1. A process for purifying polluted air, which process includes passing polluted air through a fluidized bed of micro-organism-containing particulate media while simultaneously stirring the fluidized bed so that, as the polluted air passes through the fluidized bed, organic pollutants therein are decomposed by the micro-organisms, with purified air containing a lower level of the organic pollutants than the polluted air that enters the fluidized bed, emerging from the fluidized bed.

2. A process according to Claim 1, wherein the micro-organism-containing particulate media comprises inert particles coated with an active medium or biomass.

3. A process according to Claim 2, wherein the particles have sizes that range from sub-micron to 5mm.

4. A process according to any one of Claims 1 to 3 inclusive, wherein the air that passes through the bed of particulate media acts also as fluidizing medium for the particulate media, and wherein the air flow rate is from 0.7m/s to 1.5m/s.

5. A process according to any one of Claims 1 to 4 inclusive, which includes maintaining the fluidized bed at or near anaerobic conditions by controlling the humidity in the fluidized bed.

6. A process according to any one of Claims 1 to 5 inclusive, which includes moistening the polluted air before passing it through the fluidized bed.

7. Air purification apparatus, which includes

a vessel providing an air purification chamber, with the vessel being adapted such that polluted air can enter the air purification chamber at a low level while purified air can exit the air purification chamber at a higher level;

a plurality of micro-organism-containing particulate media in the air purification chamber, the particulate media being capable of being fluidized by air which passes through the air purification chamber; and

a mixer in the air purification chamber, for mixing a fluidized bed of the particulate media which forms in the air purification chamber, in use.

8. Apparatus according to Claim 7, wherein the vessel comprises an operatively upright cylindrical wall component; an apertured or perforated floor spanning the inside of the wall component, with the openings in the floor constituting air inlet openings; and an apertured or perforated roof also spanning the inside of the wall component and spaced from the floor, with the openings in the roof constituting air outlet openings, and with the air purification chamber thus defined between the wall, the floor and the roof.

9. Apparatus according to Claim 8, which includes an air conditioning chamber below the air purification chamber, when the vessel is located uprightly, with the air conditioning chamber having an apertured roof and a floor spaced from its roof, such that air can pass through the openings in the conditioning chamber roof into the purification chamber.

10. Apparatus according to Claim 9, wherein air/liquid contact means is provided in the conditioning chamber, together with water distribution means for introducing water into or onto the air/liquid contact means.

11. Apparatus according to Claim 9 or Claim 10, wherein an air inlet chamber is provided below the conditioning chamber, with the floor of the conditioning chamber being perforated and constituting a roof of the air inlet chamber.

12. Apparatus according to Claim 11, wherein an imperforate base, spaced from the air inlet chamber roof; a cylindrical vessel wall component extending between the base and the air inlet chamber roof; and an air inlet in the vessel wall component, are provided.

13. Apparatus according to any one of Claims 8 to 12 inclusive, wherein a purified air chamber is provided above the air purification chamber, with the roof of the air purification chamber constituting a floor of the purified air chamber.

14. Apparatus according to Claim 13, which includes an imperforate roof, spaced from the purified air chamber floor; a cylindrical vessel wall component located between the purified air chamber floor and its roof, and a purified air outlet in the purified air chamber roof.

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